

CLAIMS

1. A composition for producing a polyurethane foam, the composition comprising a polyol, a polyisocyanate, a blowing agent comprising a hydrohalocarbon, and a blowing agent enhancer comprising at least one compound having a molecular weight less than about 500 g/mol and a molecular formula of $\text{RO}-(\text{CH}_2\text{CHR}''\text{O})_n-\text{R}'$; wherein:

R is selected from the group consisting of a C1-C10 aliphatic group, a C5-C10 cycloaliphatic group, a C7-C10 araliphatic group, a C1-C10 aliphatic group comprising a nitrogen atom or oxygen atom, a C5-C10 cycloaliphatic group comprising a nitrogen atom or oxygen atom, and a C7-C10 araliphatic group comprising a nitrogen atom or oxygen atom;

R' is selected from the group consisting of R, hydrogen, acetyl, propionyl, and butyryl, provided that the at least one compound has no more than one hydroxyl group per molecule;

R'' is hydrogen or a C1-C5 alkyl group; and

n is an integer greater than or equal to 1.

2. The composition of claim 1, wherein the at least one compound comprises no hydroxyl groups.

3. The composition of claim 1, wherein R'' is hydrogen or methyl.

4. The composition of claim 1, wherein the at least one compound comprises dipropylene glycol dimethyl ether.

5. The composition of claim 1, wherein the at least one compound comprises propylene glycol monomethyl ether, propylene glycol monopropyl ether, propylene glycol monobutyl ether, or a mixture of any of these.

6. The composition of claim 1, wherein the at least one compound comprises diethylene glycol monomethyl ether.

7. The composition of claim 1, wherein the hydrohalocarbon comprises at least one fluorine atom per molecule.

5 8. The composition of claim 1, wherein the blowing agent comprises HCFC-123, HCFC-141b, HCFC-22, HCFC-142b, HFC-134a, HFC-245fa, HFC-245ca, HFC-236ea, HFC-365mfc, or a mixture of any of these.

9. The composition of claim 1, wherein the blowing agent comprises HCFC-
10 141b, HFC-134a, HFC-245fa, or a mixture of any of these.

10. The composition of claim 1, wherein the blowing agent comprises a C1-C4 hydrofluorocarbon having a molecular weight between 50 and 170 g/mol, a boiling point between -60°C and 50°C, and an Ozone Depletion Potential less than 0.10.

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11. The composition of claim 1, wherein the blowing agent comprises HFC-134a, HFC-236ea, HFC-365mfc, HFC-245fa, or a mixture of any of these.

12. The composition of claim 1, wherein the blowing agent comprises HFC-
20 245fa.

13. The composition of claim 1, additionally comprising a catalyst.

14. The composition of claim 1, additionally comprising a surfactant.

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15. A composition for producing a polyurethane foam, the composition comprising a polyol, a polyisocyanate, HFC-245fa, and one or both of diethylene glycol monomethyl ether and dipropylene glycol dimethyl ether.

16. A method of making a polyurethane foam, the method comprising combining a polyol and a polyisocyanate in the presence of 1) a blowing agent comprising a hydrohalocarbon and 2) a blowing agent enhancer comprising at least one compound having a molecular weight less than about 500 g/mol and a molecular formula of $RO-(CH_2CHR''O)_n-R'$; wherein:

R is selected from the group consisting of a C1-C10 aliphatic group, a C5-C10 cycloaliphatic group, a C7-C10 araliphatic group, a C1-C10 aliphatic group comprising a nitrogen atom or oxygen atom, a C5-C10 cycloaliphatic group comprising a nitrogen atom or oxygen atom, and a C7-C10 araliphatic group comprising a nitrogen atom or oxygen atom;

R' is selected from the group consisting of R, hydrogen, acetyl, propionyl, and butyryl, provided that the at least one compound has no more than one hydroxyl group per molecule;

R'' is hydrogen or a C1-C5 alkyl group; and

n is an integer greater than or equal to 1.

17. The method of claim 16, wherein the hydrohalocarbon comprises at least one fluorine atom per molecule.

18. A composition for producing a polyurethane foam, the composition comprising a polyol, a polyisocyanate, a blowing agent comprising a hydrohalocarbon, and a blowing agent enhancer comprising at least one compound having a molecular weight less than about 500 g/mol and a molecular formula ROH, wherein:

R is selected from the group consisting of a C1-C10 aliphatic group, a C5-C10 cycloaliphatic group, a C7-C10 araliphatic group, a C1-C10 aliphatic group comprising a nitrogen atom or oxygen atom, a C5-C10 cycloaliphatic group comprising a nitrogen atom or oxygen atom, and a C7-C10 araliphatic group comprising a nitrogen atom or oxygen atom, provided that the at least one compound comprises only one hydroxyl group per molecule.

19. The composition of claim 18, wherein the hydrohalocarbon comprises at least one fluorine atom per molecule.

20. The composition of claim 18, wherein the at least one compound is
5 selected from the group consisting of methanol, ethanol, isomers of propanol, isomers of butanol, isomers of pentanol, isomers of hexanol, isomers of heptanol, isomers of octanol, isomers of nonanol, isomers of decanol, and mixtures of any of these.

21. A polyurethane composition comprising a product of a reaction between a
10 polyol and a polyisocyanate, the reaction taking place in the presence of 1) a blowing agent comprising a hydrohalocarbon and 2) a blowing agent enhancer comprising at least one compound having a molecular weight less than about 500 g/mol and a molecular formula of $RO-(CH_2CHR''O)_n-R'$; wherein:

15 R is selected from the group consisting of a C1-C10 aliphatic group, a C5-C10 cycloaliphatic group, a C7-C10 araliphatic group, a C1-C10 aliphatic group comprising a nitrogen atom or oxygen atom, a C5-C10 cycloaliphatic group comprising a nitrogen atom or oxygen atom, and a C7-C10 araliphatic group comprising a nitrogen atom or oxygen atom;

20 R' is selected from the group consisting of R, hydrogen, acetyl, propionyl, and butyryl, provided that the at least one compound has no more than one hydroxyl group per molecule;

R'' is hydrogen or a C1-C5 alkyl group; and

n is an integer greater than or equal to 1.

25 22. A composition for producing a polyurethane foam, the composition comprising 1) one but not both of a polyol and a polyisocyanate, 2) a blowing agent comprising a hydrohalocarbon and 3) a blowing agent enhancer comprising at least one compound having a molecular weight less than about 500 g/mol and a molecular formula of $RO-(CH_2CHR''O)_n-R'$; wherein:

30 R is selected from the group consisting of a C1-C10 aliphatic group, a C5-C10 cycloaliphatic group, a C7-C10 araliphatic group, a C1-C10 aliphatic group

comprising a nitrogen atom or oxygen atom, a C5-C10 cycloaliphatic group comprising a nitrogen atom or oxygen atom, and a C7-C10 araliphatic group comprising a nitrogen atom or oxygen atom;

5 R' is selected from the group consisting of R, hydrogen, acetyl, propionyl, and butyryl, provided that the at least one compound has no more than one hydroxyl group per molecule;

R" is hydrogen or a C1-C5 alkyl group; and

n is an integer greater than or equal to 1.

10 23. The composition of claim 22, wherein the hydrohalocarbon comprises at least one fluorine atom per molecule.

24. A composition for producing a polyurethane foam, the composition comprising a polyol, a polyisocyanate, a blowing agent comprising a hydrohalocarbon,
15 and a blowing agent enhancer comprising at least one compound having a molecular weight less than about 500 g/mol and a molecular formula of one of ROH and RO-(CH₂CHR"O)_n-R'; wherein:

R is selected from the group consisting of a C1-C10 aliphatic group, a C5-C10 cycloaliphatic group, a C7-C10 araliphatic group, a C1-C10 aliphatic group comprising a nitrogen atom or oxygen atom, a C5-C10 cycloaliphatic group comprising a nitrogen atom or oxygen atom, and a C7-C10 araliphatic group comprising a nitrogen atom or oxygen atom;

20 R' is selected from the group consisting of R, hydrogen, acetyl, propionyl, and butyryl, provided that the at least one compound has no more than one hydroxyl group per molecule;

R" is hydrogen or a C1-C5 alkyl group; and

n is an integer greater than or equal to 1.